REMARKS

Reconsideration and further examination is respectfully requested. Claims 1, 3-6 and 8 are currently pending in this application.

In the Drawings

A set of annotated figures, marking figures 1A and 1B as 'Prior Art' , and also illustrating the correct numbering of the step boxes, are attached hereto. A set of replacement sheets is also provided herewith.

Rejections under 35 U.S.C. §102(e)

Claims 4 and 5 were rejected under 35 U.S.C. §102(e) as being anticipated by Borella et al, U.S. 6,643,259.

Borella:

Borella describes the use of a combination of typical TCP behavior in conjunction with a maximum congestion window for the purposes of controlling data transfer across an interface at column 13, lines 3-62:

> "...A maximum congestion window ("cwnd*") is computed at Step 186. The maximum congestion window cwnd* is to be distinguished from the sliding congestion window cwnd described above. The value of the maximum congestion window is computed in response to the product b.times.RTT, where b is the value of the constant bitrate.... ***b.times.RTT is the number of bits that can be unACKed at any one time between the first network device 14 and the second network device 16.*** Thus, TCP 62 is able to determine, from a given bitrate b and its running value of RTT, what its cwnd* value should be....
>
> A congestion window value is obtained from a congestion control process in the lower layer of the protocol stack for the first network device 14 at Step 188. ***In one exemplary preferred embodiment, the congestion window value is cwnd as obtained from the TCP 62 process 120 of FIG. 4 and depicted in FIG. 6.*** ...
>
> At Step 190, the transfer of an amount of data is made from the higher layer to the lower layer of the protocol stack for the first network device equal to ***a minimum of the congestion window value and the maximum congestion window***....Ordinarily, TCP 62

increases cwnd until there is a timeout when data packets are unACKed or there are duplicate ACKs. This behavior produces the characteristic"sawtooth wave" effect of FIG. 6. ***However, if the amount of data transferred is never increased beyond cwnd*, a timeout will not happen and the first network device's 14 data throughput is more likely to remain constant, near the given bitrate b****....* In another exemplary preferred embodiment, the TCP 62 process limits itself so that cwnd is never increased beyond cwnd*. Step 190 of Method 180 includes determining whether cwnd is greater cwnd*, and if so, replacing the cwnd with the cwnd* in the TCP 62 process. The amount of data transferred from the application layer to the transport layer of the protocol stack 50 is equal to cwnd*. *A TCP 62 process that limits itself so that cwnd is never increased beyond cwnd*, may not provoke a timeout and the first network device's 14 TCP 62 throughput is more likely to remain constant.* In these embodiments, all other aspects of TCP 62 are essentially unchanged. For example, if a packet is unACKed, cwnd is reduced to MSS as before. This will guarantee that a TCP 62 layer including the above-described Method 180 will still exhibit TCP's 62 characteristics when not using a CBR channel to itself....

Accordingly, it would appear that Borella seeks to control the transfer of data over an interface so that congestion does not occur. Applicant's position is strengthened by the example cited by Borella which recites:

"... FIG. 8 is a diagram illustrating the throughput of an optimized congestion control process for a constant bitrate channel as described above. After a timeout 200, the congestion window and throughput increase according to an existing TCP 62 process. Above ssthresh, the value of cwnd will increase linearly 202 until it reaches the value of the maximum congestion window cwnd* 204. The value of cwnd* 204 is computed in response to the product of the continually updated return trip time RTT and the constant bitrate b for the CBR channel. **The throughput is prevented from overextending beyond the capacity 168 of the channel and periodically suffering timeouts,...** *For the constant bitrate channel described herein, the throughput stops short of overextending itself and more fully and efficiently uses the capacity of the channel.* The throughput may remain at the optimal level for extended periods of time but may face an occasional timeout 206 from fluctuations in the round trip delay time. As can be seen from FIG. 8, TCP 62 uses close to all of the available capacity of a CBR channel. In addition, the Method 810 for optimizing data transfer is essentially independent of the version of TCP 62 that is running in the transport layer..." (Borella, column 14, lines 14-37)

Borella thus seeks to provide a system in which 'timeouts do not occur', where the timeout is 'the detection of a congestion condition' that previously caused the congestion

window to be halved, thereby reducing the available bandwidth transfer on the link. To overcome this situation, Borella proposes a scheme whereby the data that is forwarded on the link is incrementally increased until a maximum congestion window is met. Data is prevented from being transferred from an upper level protocol of an application to a lower level protocol at any rate that exceeds the maximum congestion window.

In contrast, claim 4 as amended now recites "... A method of controlling congestion in a communications network, the method comprising ... ***detecting a congestion condition*** in a connection between two nodes in the communications network, the connection having a desired bandwidth,... and upon detection of the potential congestion condition, controlling new traffic emitted into the network to be no more than a current unacknowledged traffic load of the network at the time of detection..."

Applicants can find no such teaching in Borella. Rather than allow traffic to be placed on a network until a congestion condition is detected, Borella limits the output of traffic onto a network, to prevent congestion from occurring. In contrast, the present invention permits traffic to be forwarded onto a network until congestion occurs, at which point the traffic is reduced in a controlled manner. Accordingly, for at least the reason that Borella fails to describe or suggest every limitation in the claims, the rejection of claim 4 under 35 U.S.c. §102(e) is improper, and should be withdrawn.

Applicants claim 5, as amended, now recites "...The method of claim 4, wherein the network is a private network, and wherein a total bandwidth of the private network is allocated among a plurality of connections between a plurality of nodes in the private network to provide a

desired bandwidth for each connection, and wherein the step of controlling new traffic maintains the desired bandwidth on the connection..." No such structure is found in Borella.

The Examiner states, at page 2 of the office action "Borella describes that the data network can be a campus network or a private network..." However, Borella neither describes nor suggests that 'a total bandwidth of the private network is allocated among a plurality of connections..." Accordingly for at least the reason that Borella fails to describe all the limitations of claim 5 it is respectfully requested that the rejection has been overcome and should be withdrawn.

Rejections under 35 U.S.C. §103

Claims 1, 3 6 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Borella in view of Ohyama et al. (U.S. 6,278,691).

Ohyama:

Ohyama describes, in the Abstract "...A communications system has a real time signal generating part for generating the real time signal of data rate R with one frame as one unit; a transmission part, having a transmission rate C (C>R), over which the real time signal is transmitted; and a real time signal outputting part for outputting the real time signal stored in a real time signal receive buffer part, wherein after storing the real time signal for a prescribed number, N, of frames in the real time signal receive buffer part, the real time signal outputting part is activated, thereby performing control so that all generated portions of the real time signal can be output at the receiving end without interruption..."

Ohyama is concerned with the impact of network congestion on real-time signaling. The Examiner relies on Ohyama's teaching of the concepts of TCP, in particular the paragraph spanning column 5 lines 66 through column 6 lines 9, which states:

> " ... To avoid congestion collapse, in TCP it is recommended to use two techniques, slow start and multiplicative decrease congestion avoidance.... In multiplicative decrease congestion avoidance, a second restriction called a congestion window is provided to control congestion, and anytime, TCP compares the receiver's window size (buffer size) with the congestion window size and uses the smaller window in transmission. Each time a segment loss is detected, the congestion window size is reduced by one half (the minimum value is 1 segment) and the timeout interval is doubled. This strategy provides a quick and significant decrease in traffic and allows a sufficient time to clear the datagrams already queued at the router... When it is determined that the congestion has ended, TCP initializes the congestion window to 1, sends the first segment, and waits for an acknowledgement. Thereafter, the congestion window is increased by one segment each time an acknowledgement arrives. This technique is called slow start.... To prevent the window size from increasing too rapidly and thereby causing congestion again, TCP provides a still another restriction. That is, when the congestion window size reaches one half of its original size, TCP enters a congestion avoidance stage and reduces the increasing speed of the congestion window size. During the congestion avoidance period, the congestion window is increased only by 1 even if the acknowledgements for all the segments in the window are received... The above has described the process in TCP from the occurrence of congestion to the recovery from the congestion. ***While this process is in progress, the network can only transmit data at a lower transmission rate than its actual transmission capacity and imposes extra loads on end points. This presents a problem, especially when transmitting real time signals.*** That is, the real time signals cannot be delivered in time and the real time requirement is impaired..."

Thus Ohyama recognized much the same problem with TCP as Borella described with regard to Figures 5 and 6. In contrast to Borella's solution (where transmissions are tightly controlled so that a limit is not exceeded) Ohyama accumulates data in advance. As stated at column 12, lines 6-15 of Ohyama:

> "...The important point of the present invention is that even when the transmission capacity is temporarily restricted due to congestion, etc. rendering it impossible to transmit a real time signal within the real time, since data are accumulated in advance at the receiving terminal the real time signal can be output without interruption as long as the accumulated data are output, and when recovered from the congestion, the valid data accumulated in the transmit buffer are transmitted successively until data for a prescribed number of frames are accumulated in the receive buffer as in the previous normal operating condition...."

The Examiner states, at pages 3-4 of the Office Action:

"Regarding claim 1, Borella discloses a method of controlling congestion between a first sender (figure 1, unit 14 and a second sender (figure 1, unit 16) in a communication network (see figure 1) comprising: entering a congestion avoidance state when some form of congestion has been detected (claimed detecting a potential network congestion condition); wherein during the congestion avoidance state, a congestion window (cwnd) is increased so that the first device 14 transmits traffic in accordance with the available bandwidth of the network (claimed desired fixed bandwidth), see column 9, lines 64-67 and column 10, lines 1-13.....

Borella does not disclose connection bandwidth is lesser of a current amount of unacknowledged traffic emitted by the sender into a network at the time of detection of the congestion condition and a current receiver buffer size at that time.... However, Ohyama discloses providing a congestion window (*Examiner interpreted the congestion window as the bandwidth of the connection*) for controlling congestion, and the receiver buffer size is compared with the congestion window size and uses the smaller window in transition (Connection bandwidth is lesser of a current amount of unacknowledged traffic emitted by the sender into the network at the time of the detection of the congestion condition and a current receiver buffer size at that time) See column 5,lines 66-67 and column 6 lines 1-11...

Therefore it would have been obvious to an ordinary person of skill in the art at the time the invention was made to prevent the overflowing of Borella's receiver buffer using the congestion window method taught by Ohyama so that in addition to receiving new traffic at a congested phase of Borella, measures would be taken to not overflow the receiver buffer. The benefit would be better bandwidth utilization due to less congestion due to the receiver's buffer congestion eliminations..."

Applicants respectfully disagree for the following reasons.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim

limitations. Applicants respectfully submit that the combination of Borella and Ohyama fails to satisfy these criteria with regards to claims 1, 3, 6 and 8 for the following reasons.

1. No motivation can be found for the modification suggested by the Examiner

As discussed above, Borella determined that the current TCP architecture effectively cuts the transmission bandwidth in half when congestion is encountered (see Figures 5 and 6 of Borella). Thus, Borella overcomes this problem by providing a maximum window, cwnd*, which is defined to be bxRTT, where b is the value of the desired constant bit rate, and RTT is a round trip transit time. Borella states "... the amount of data transferred is never increased beyond cwnd*" and with such an arrangement "a timout will not happen..." In contrast Ohyama overcomes the same problem by adding additional buffering to ensure that real-time output can be maintained.

The Examiner's motivation for combining the two references is "...Therefore it would have been obvious to an ordinary person of skill in the art at the time the invention was made to prevent the overflowing of Borella's receiver buffer using the congestion window method taught by Ohyama so that in addition to receiving new traffic at a congested phase of Borella, measures would be taken to not overflow the receiver buffer..."

Applicant's disagree that such a motivation can be found in the combination of references, for at least the reason that Borella *already* describes a system where the buffer does not overflow because the data put into the pipe between the source and destination is limited to b x RTT. Accordingly for at least the reason that the motivation cited by the Examiner cannot be found in the combination of references, the rejection under 35 U.S.C. §103 is improper and should be withdrawn.

2. <u>There is no reasonable expectation of success from the combination suggested by the Examiner</u>

Applicants note that Borella and Ohyama both seek to solve different problems. Borella seeks to deal with the problems caused by the current TCP congestion control protocol by limiting data that is put into the pipe to minimize the chance that congestion will occur. Ohyama seeks to ensure that real time data can still be output in the face of congestion. Incorporating Borella's solution of limiting traffic that is put into the pipe would only serve to frustrate Ohyama's goal of providing real time data by reducing the overall bandwidth of the interface.

With regard to Ohyama's description of the TCP congestion control mechanism, Applicants note that it is the same control mechanism that is described as problematic in Borella, namely 'Each time a segment loss is detected, the congestion window size is reduced by one-half..." As described in Borella with regard to Figure 5, cutting the transmission rate in half upon the detection of congestion serves results in underutilization of a data path, which is disadvantageous in a constant bit rate environment.

Accordingly, for at least the reason that the modification of the references resulting from the combination would serve to frustrate the goals of both Borella and Ohyama, there is no reasonable expectation of success resulting from the combination. For this additional reason, the rejection is improper and should be withdrawn.

3. <u>Combination neither describes nor suggests claimed invention</u>

<u>Claim 1:</u>

However, even assuming that a proper combination of the references could be made, the combination still would neither describe nor suggest the limitations of the claimed invention as reflected in Claim 1, which recites "...A method of controlling congestion in a communications network, the method comprising .... detecting a network congestion condition on a connection between a sender and a receiver in the communications network, *the network congestion condition detected in response to an occupancy threshold of a transmit buffer of the sender*; the connection having a desired fixed bandwidth and *upon detection of the potential network congestion condition, controlling new traffic emitted into the network to not exceed the desired fixed bandwidth for the connection*, wherein the desired fixed bandwidth.is the lesser of a current amount of unacknowledged traffic emitted by the sender into the network at a time of detection of the congestion condition, and a current receiver buffer size at that time...." No such limitation of 'the network congestion condition detected in response to an occupancy threshold of a transmit buffer of a sender' and the resulting claimed actions are found in the combination of Borella and Ohyama. For at least this reason it is respectfully submitted that the rejection under 35 U.S.C. §103 is overcome and should be withdrawn.

Claim 3:

Dependent claim 3 recites "...The method of claim 1, wherein the network is a private network, and wherein a total bandwidth of the private network is allocated among a plurality of connections between a plurality of nodes in the private network to provide a desired bandwidth for each connection, and wherein the step of controlling new traffic maintains the desired bandwidth on the connection...." No such structure is shown or suggested in the combination of Ohyama and Borella. For at least this reason it is requested that the rejection of claim 3 be withdrawn.

Claim 6:

Applicants claim 6 recites "...A method of controlling congestion in a communications network, the method comprising ... *determining whether a congestion condition is present in response to an occupancy threshold of a transmit buffer in the communications network* ... when a congestion condition is present, setting a congestion window size to a prescribed value , wherein the prescribed value is the lesser of a current amount of unacknowledged traffic emitted by the sender into the network at a time of detection of the congestion condition, and a current receiver buffer size at that time ... and controlling traffic from a sender delivered onto the network so that the amount of unacknowledged traffic from the sender on the network does not exceed the congestion window size..." No such structure is shown or suggested in the combination of Ohyama and Borella. Accordingly, for at least the reason that the combination of Borella and Ohyama fail to describe all the limitations of the claims, the rejection is overcome and it is requested that it be withdrawn.

Claim 8:

Applicant's claim 8 has been amended to recite the steps of "...A method of controlling congestion on a connection in a network coupling a transmitting and receiving node, wherein the network is a private network and each connection in the network has an allocated bandwidth, the method including the step of ... forwarding packets on the connection at a bandwidth allocated to the connection ... monitoring the connection for indications of congestion on the connection, the indications including indications of dropped packets ... and controlling a rate of retransmission of the dropped packets to ensure that the allocated bandwidth of the connection is not exceeded..."

No such structure is shown or suggested in Borella or Ohayma, alone or in combination. In particular, as pointed out in Applicants specification, the claimed architecture is associated with a system which uses a protocol *other* than TCP for transferring packets and controlling congestion in a network. As recited at page 6 of Applicants specification:

"... the present invention uses Stream Control Transmission Protocol (SCTP) rather than TCP... SCTP provides a reliable transport service, ensuring that data is transported across the network without error and in sequence..." As described at page 10 of Applicants specification, a modified SCTP may advantageously provide the following benefit: ".... when the behavior of sources can be anticipated or controlled to regulate the amount of traffic on the network, it is possible to avoid congestion by making end-to-end connections look like fixed bandwidth pipes where the total bandwidth allocated to these connections stays within the limits of the bandwidth of the available network..." No such system is contemplated by Ohyama, Borella or the combination thereof. For at least this reason, claim 8 is patentably distinct over the combination of references, and the rejection should be withdrawn. New dependent claims 9-13 depend from and serve to add further patentable limitations to claim 8, and are allowable for at least the reasons put forth with regard to claim 8.

Conclusion:

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone the undersigned, Applicants' Attorney at 978-264-6664 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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Date

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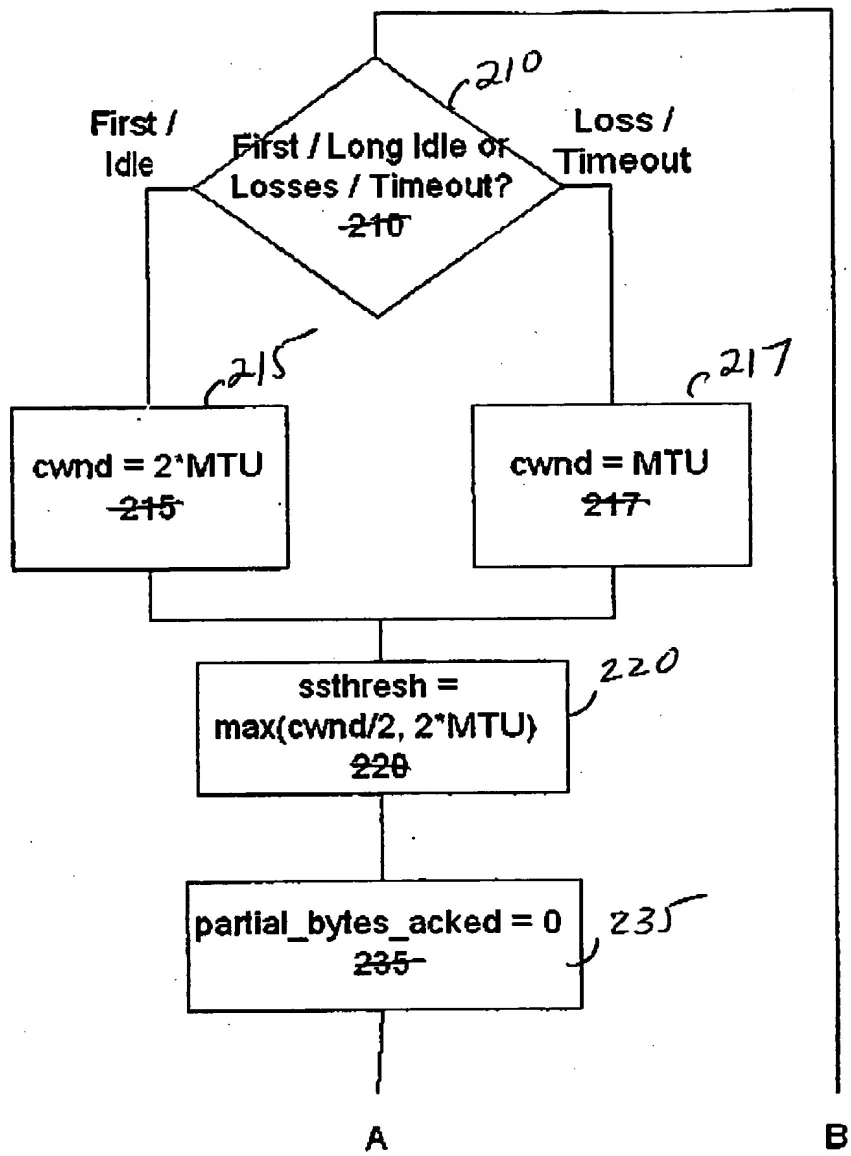
Annotated Sheet



PRIOR ART

FIG. 1A

("Annotated Sheet")

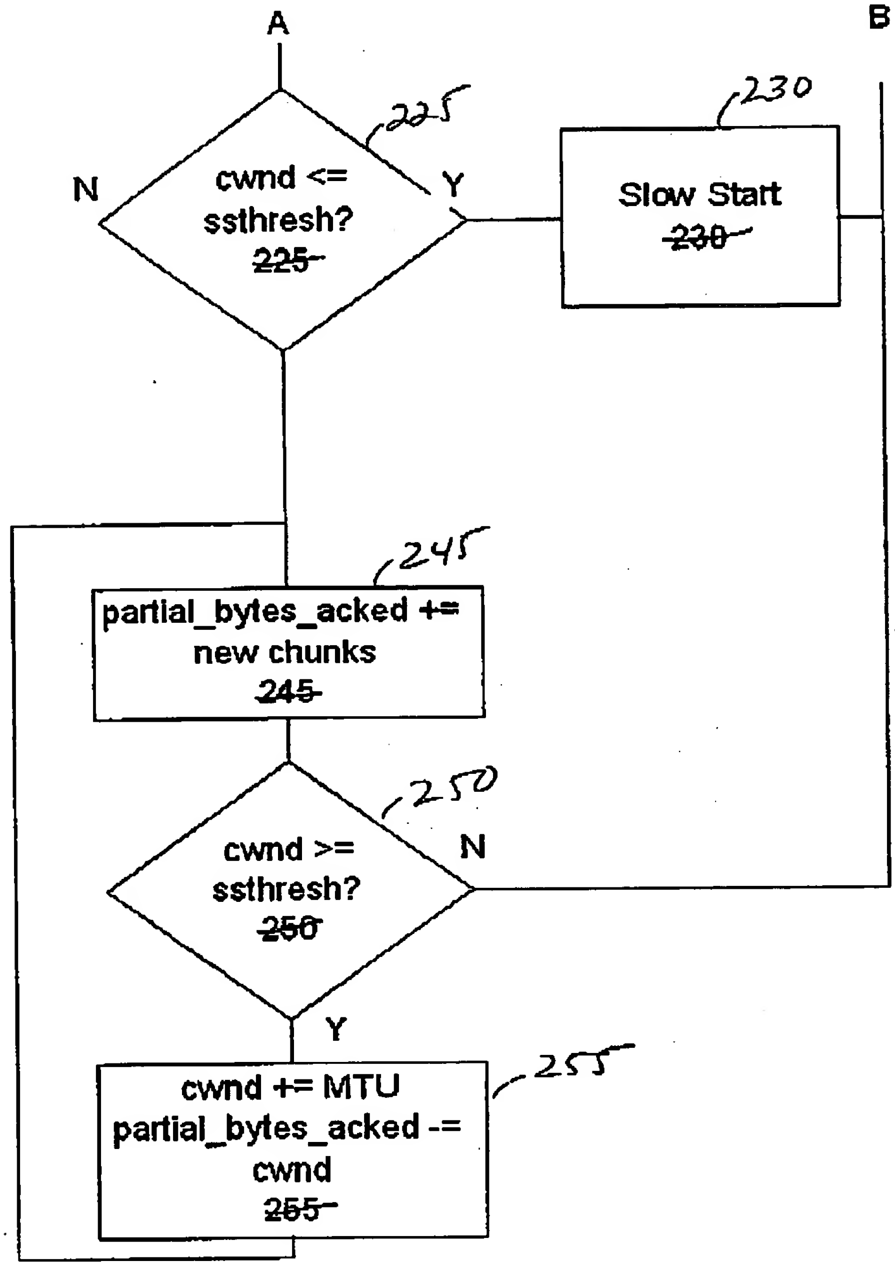


FIG. 1B

(Annotated Sheet)

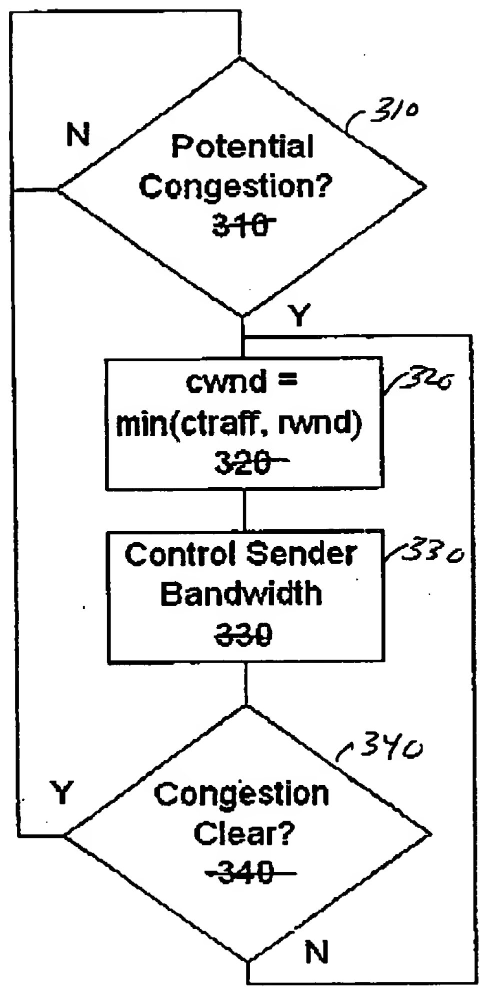


FIG. 2